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COAL CONSERVATION IN HUNGARIAN RAILROAD OPERATION

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The most effective way in which the railroad can comply with the conservation order of the Hungarian government is in the conservation of coal and electricity. Since there is no significant water power in Hungary, the generation of electricity depends on coal. The electrified section of MAV (Hungarian State Railroad) gets its power from the coal-burning generating plant at Banhida. The railroads use more than 10 million kilowatt-hours annually, whose generation requires approximately 10,000 tons of domestic coal.

One way in which electricity may be saved is by not burning the 500- and 1,000-watt bulbs at railroad stations longer than necessary. One of the employees of a railroad station may be designated power trustee; he would supervise conservation of power in his area. A saving of 10 percent in current used for lighting means 1,000 tons of coal saved. Consumption of electricity in MAV shops is now being brought under control by the Plan Office's order cutting the electric power allotments of shops by 25 percent.

Much power is wasted because of poor management. For example, the Landler Automotive-Repair Shop uses approximately 4 million kilowatts per year, 996,000 kilowatt-hours being consumed in the process of compressing air. The Banhida electrical plant requires 1.17 kilograms of standard coal to produce one kilowatt-hour. Therefore, the annual consumption of electricity of the Landler shop is equal to nearly 5,000 tons of coal. Yet at the Landler shop, little attention is paid to the constant noise of escaping air.

Electric-power consumption of [MAV?] shops is equivalent to 20,000 tons of coal. A 10-percent reduction in the consumption of electricity in shops will save about 2,000 tons of coal per year. A reduction of 8 percent in the actual coal consumption of MAV boiler houses and blacksmith shops would save tens of thousands of tons annually. The coal-conservation program can be carried out effectively only by assigning a power trustee to each shop to determine in detail the quantity of power to be allotted for specific operations. Power can be conserved effectively only through the daily effort of millions of workers. Shop

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heads should determine the possibilities of conservation of power in their areas. The tasks in coal conservation, then, are the scientific determination of power norms, organization of a power-trustee system, and constant and strict supervision.

The largest single consumer of coal in transportation is the operations department of the railroad, which uses several hundred thousand tons per year. This is multiplied several hundred times by the consumption of MAV shops and by the coal equivalent of electric power used. Inefficient utilization of coal energy and the poor quality of domestic coal emphasize the need for electrification of railroad lines or conversion to diesel-electric locomotives.

A V-40 electric locomotive uses 3.2 kilowatt-hours per 100 car-ton-kilometer /unit of ton-kilometer combined with the effort of running a 100-car train loaded to capacity?7 It takes 3.5 kilograms of coal to produce this energy. The Model 424 steam locomotive, however, which has the most economical rate of coal consumption, requires 7 kilograms of coal per 100-car-ton-kilometer, twice the equivalent of the electric locomotive. On the country's single electric line, in November, 1,280,000 hundred-car-ton-kilometers were hauled by the Kando electric locomotives, which resulted in a saving equivalent to 4,480 tons of standard coal. Electric locomotion is one forint cheaper per 100-car-ton-kilometer than steam. Although enough electric locomotives are available, wasteful steam locomotives are still being used on the electrified Hegyeshalom line. Operation of electric locomotives should be increased at least 10 percent, which would mean a yearly conservation of 5,000 tons of coal. The Five-Year Plan provides for the electrification of 180 kilometers of railroad line.

Forty percent of the heat energy of burning coal in a locomotive is lost because of inefficient firing and incomplete combustion. Incomplete combustion is caused largely by resistance to air draft because of uneven firing, the high ash content of domestic coal, a rapidly deepening fire layer, dropping coal, cleaning the burning layer, soot, high temperature of exhaust gas, radiation, etc. Thus, freshly added clean coal does not receive the 10 cubic meters of air per kilogram necessary for complete combustion and the production of 8,100 calories per kilogram. Consequently, only 2,370 calories are produced in converting the coal to carbon monoxide, and the remaining 5,730 calories, or 70 percent of the heat content, is lost with the escaping carbon monoxide. This is a 30-percent utilization of coal heat, which means that at least three times as much coal must be burned to get the same performance from the locomotive as would be possible with complete combustion.

In addition to lack of air, incomplete combustion and energy loss are aided greatly by the occasional absence of a flame-box /sic/, in which case smoke enters the fire tubes without first mixing with incoming air and heating it to the kindling temperature of the coal. The incoming air gouges a hole in the fire layer, does not take part in combustion, and lowers the temperature of the firebox, retarding instantaneous combustion of the developing gases.

Of the total heat developed, 52 percent departs with the exhaust steam, 3 percent is necessary for autolocomotion of the locomotive, and only 5 percent represents useful work accomplished.

A frequently recurring condition in locomotive operation is combustion with a 25-percent deficient air supply. This may result from failing to add coal in an even, thin layer, especially when much smoke is being formed during the addition of a coal charge. With a 25-percent deficient air supply, 64 percent of the heat energy of the coal, or 5,200 calories, are released, and 2,900 calories, or 36 percent, are wasted. Under these conditions, coal consumption also rises 50 percent. Since the energy loss is proportionately lower, it would be more efficient to operate with a constant excess of air. With a 25-percent excess air supply, only 350 calories are lost. With a constant, strong draft, a sufficient excess of air is assured by maintaining an even, thin layer of coal

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which produces little smoke. This emphasizes the problems created by using some of the high-ash content domestic coals in locomotives. Domestic coals such as that mined at Maza (ash content, 40 percent), at Nagybatony (38 percent), at Tatai-pala, and all those with an ash content of 30 percent or more should not be considered coal. The practice of mixing high-ash-content coals with high-heat-producing coals for use in locomotives causes fusing of the fire layer and restricts the air supply. As a result, heat equivalent to 25 percent of the coal added is not utilized and is lost with the escaping steam. This loss is due to the inherent inefficiency of the piston steam engine and cannot be economically reduced by improving the design of present locomotives.

This waste can be reduced only by locomotive operators. The engineer can contribute through an economical use of power, by maintaining the highest permitted boiler pressure under all conditions and by keeping the throttle wide open. The fireman can best aid energy conservation by using the exhaust poppet when the locomotive is running at full damper and feeding 5 percent of the exhaust steam back into the boiler. The proper position of the piston rod and good piston-rod packing and piston rings are important. In the future, instead of relying on the engineer's musical ear, piston rods will be installed with the use of indicator instruments and secured with lead.

The energy contained in exhaust steam can be conserved primarily by using steam only when absolutely necessary. If the train is in motion, live energy must be exploited by running at top speed. The appended graph shows how much coal is wasted by bringing to a halt a 450-ton and a 2,000-ton train operating at various speeds. Locomotive Model 424, which may be considered to represent both passenger and freight locomotives, is taken as the standard. A 2,000-ton train (load category No I), operating at 30 kilometers per hour, loses the energy equivalent of 80 kilograms of coal by being brought to a halt. The first 2,000-ton train which arrived in Hatvan on 15 August 1949 made only one stop in 115 kilometers, and had a surprisingly low coal consumption.

A normal 450-ton express train running at 90 kilometers per hour wastes 250 kilograms coal in stopping. Thus, coal can and should be conserved by reorganizing the timetables. Justified and unjustified halts at signals -- and nearly all are unjustified -- exceed 10,000 per month. Allowing 80 kilograms per halt, this amounts to a waste of 9,600 tons of coal per year. Thus, reducing the number of stops would mean a great saving in energy.

Although the best opportunity for complete exploitation of locomotives is during the fall shipping season, fall rail traffic during the past 2 years has proved very expensive in terms of coal consumption. Rail traffic during the fourth quarter of 1949 was 3 percent greater than that of the third quarter. The burden on locomotive shops was unchanged. There was an increase of one kilogram in hundred-car-ton-kilometer coal consumption. Thus, 3 percent more freight was transported in the fourth quarter at much greater expense and with much greater consumption of coal. Third-quarter traffic during 1950 was equal to that of the fourth quarter 1949. Still, 100-car-ton-kilometer coal consumption increased nearly 2 kilograms in 1950. If the 1950 summer rate of consumption could have been maintained in the fall, including increased coal consumption due to the cold, tens of thousands of tons of coal could have been conserved.

The main reason for this waste was that freight loading per train dropped 6 percent below loading during the summer traffic peak. The 2,000-ton movement was not fostered, under the excuse of the prohibition against holding up a train while waiting for more cars. Trains were made up and dispatched with less than normal loads. For months, electric locomotives were pulling 600-ton -- 700-ton loads instead of 900 tons. Consequently, freight piled up. With the above mismanagement, the cold of the winter, and the poor quality of some mixtures of coal, the continued waste of more tens of thousands of tons may be expected.

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It should be thoroughly investigated whether rapid car turnaround and rapid movement of fall freight is worth such a waste of energy when the interests of the country as a whole are considered.

The chief lesson to be learned from fall rail-traffic congestion is that the proper train load of locomotives should be considered of primary importance. Present train loads should be increased 8 percent. The effectiveness of coal conservation drives is shown by the results of the MAV operations department Stakhanovites' pledge at the Stakhanovite congress, to use 8 percent less coal, thereby saving 100,000 tons. The pledge was fulfilled and exceeded and 120,000 tons of coal were conserved.

As a result of the 1950 2,000-ton-train campaign, 23,000 fewer tons of coal were consumed than in 1949. This year, the 2,000-ton-train campaign should conserve at least 23,000 tons, compared to 1950. This aim is very high but it can be reached. The total car freight of the 1951 2,000-ton-train campaign should reach at least 8 million tons, 100 percent more than in 1950.

The 500-kilometer campaign, which was instituted 24 February 1950 with the advice of Soviet engineer Panyin, resulted, in 1950, in the conservation of 104,324 locomotive days. This figure is derived from the number of locomotives taken out of operation. Thus, the number of kilometers hauled per day by locomotives which remained in operation had to be increased, at the same time conserving 104,324 steam-head-maintenance days. Forty kilograms of coal per hour are required to maintain first-degree pressure (full pressure for line hauling), and 20 kilograms per hour are needed for second-degree pressure (chiefly standing in the heating house). Therefore, the 104,324 steam-head days, or 2,503,676 hours, represent a saving of at least 50,063,520 kilograms of coal, assuming only second-degree pressure was maintained. Thus, from its inception on 24 February 1950 to the end of the year, the 500-kilometer campaign resulted in the conservation of 50,000 tons of coal.

The next main task will be to increase the number of locomotives used in the 500-kilometer campaign, so that 5 percent of the remaining locomotives can be taken out of operation. This should result in the conservation of 210,000 locomotive days in 1951, which is equivalent to an additional 50,000 tons of coal. This is also an ambitious goal, but the Stakhanovites in the operations department have pledged to attain it.

The goal to be reached in 1951 in the more-kilometers-between-washings movement is an average of 10,000 kilometers between boiler washings, which is a 400-percent increase over the present average of 2,500 kilometers. A 10,000-kilometer average between boiler washings will mean increasing the capacity of locomotive shops and a saving of several thousand tons of coal, and would be a great help to the 500-kilometer campaign.

The coal-conservation movement in the railroads has meant that shops have conserved 7,000 tons of coal per year. In train operations, Kando electric locomotives conserved the equivalent of 5,000 tons of coal, the 2,000-ton-train campaign saved 23,000 tons, the 500-kilometer campaign saved 50,000 tons, and increasing the burden on locomotive yards by 8 percent resulted in the conservation of 72,000 tons, totaling 150,000 tons of coal. These figures are accurate and are derived from consumption statistics covering the past 2 years. Thus it is apparent that the 120,000-ton-conservation goal was inadequate, and MAV can and should save 150,000 tons per year. An official of the MAV mechanical department will be appointed to direct the conservation movement and to assure attainment of the 150,000-ton goal.

/Appended graph follows./

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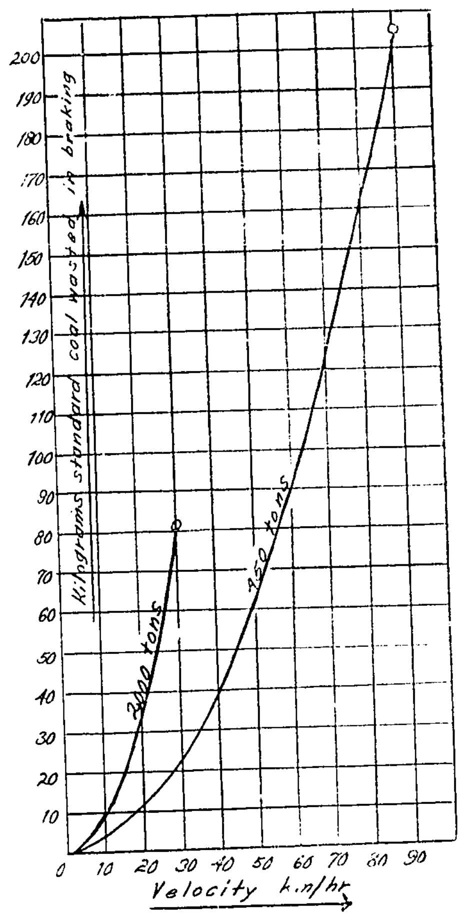

Coal Wasted by a Model 424 Locomotive Hauling a 450-Ton and a 2,000-Ton Train When Stopping From Various Speeds

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